Environmental Operations, Inc.
CLEARING THE WAY

February 9, 2017

Mr. Bruce Morrison
Project Manager
U.S. Environmental Protection Agency, Region 7
11201 Renner Boulevard
Lenexa, KS 66219

RE: Vapor Intrusion – Sub Slab Sampling Revised Report
Solutia – John F. Queeny Plant
St. Louis, Missouri
EPA ID No. MOD 004 954 111

Dear Mr. Morrison:

EOI is providing this revised report on behalf of SWH Investments II, to address obligations under an Administrative Order on Consent (EPA Docket No: RCRA-07-2009-0015), and to prepare the property for redevelopment for industrial/commercial use. The July 5, 2016 Groundwater and Vapor Intrusion Work Plan was approved by the United States Environmental Protection Agency (EPA) via their letter dated July 19, 2016. This revised letter report covers the first phase of work conducted for the vapor intrusion component of the plan, and comments received from EPA in their letter dated January 10, 2017.

Background and Purpose

Prior to implementing the approved plan, EPA sent an email on August 19, 2016, which had comments pertaining to work not specified in the plan. A conversation with EPA and the Missouri Department of Natural Resources (MDNR) was held on August 22, 2016, and the agreed-upon work plan changes were memorialized in an email to EPA and MDNR on August 23, 2016. Specifically, the soil gas portion of the plan was deleted. In addition, the sub-slab vapor testing was augmented from one point per building to two points per building. This initial phase of an iterative process concerning vapor intrusion generated data to evaluate potential existing concerns for vapor generation from the groundwater impacts in downgradient locations to the north of the site. This report describes the field work and test results. The report also provides recommendations for the next phase of work.

Approach

The vapor intrusion evaluation at the Solutia site is being conducted in phases. The first phase involved evaluating the most recent groundwater data (May 2015) to determine if volatiles present in the closest upgradient groundwater are potentially a threat via the vapor intrusion pathway. To make this determination, the USEPA's Vapor Intrusion Screening Level (VISL) Calculator (USEPA, Nov. 2015) was used to screen for constituents of potential concern (COPCs). Screening was performed by comparing the maximum detected chemical concentration of volatile organic chemicals (VOCs) to levels established in the VISL calculator, for the industrial scenario at the 1E-05 cancer risk target level. Chemicals exceeding their respective screening level are considered to be COPCs and are evaluated further. Note that there are no values in the guidance for cis or trans 1,2-dichloroethene.

The COPCs include the following as approved by EPA: 1,1,1-trichloroethane, 1,2-dichloroethane, acetone, benzene, chlorobenzene, chloroform, cis-1,2-dichloroethene, ethylbenzene, methylene chloride, tetrachloroethene (PCE), toluene, trichloroethene (TCE), trans-1,2-dichloroethene, vinyl chloride, and xylenes. Due to the proximity of the diesel storage tank used by the school bus company and located immediately upgradient to the bus maintenance facility, naphthalene was added as a COPC at that location to evaluate potential presence of diesel fuel versus detections associated with the historic impacts.

The general Solutia site location is depicted in Figure 1. Figure 2 shows the two buildings identified and described in the work plan for collecting the sub-slab samples. The figure also shows the approximate location of the samples and their designation. These buildings are on property owned by Ahrens Contracting, Inc. (Ahrens). Mr. Ted Ahrens, Jr. was contacted to facilitate access. To minimize any disruptions to regular work activities at the planned locations, at the request of Mr. Ahrens, we agreed to conduct the sub-slab vapor collection on Saturday, September 24, 2016.

Field Work

Collection of sub-slab vapor samples was conducted on September 24, 2016. Ms. Christine Kump-Mitchell with MDNR was on-site observing and available for questions or input. Mr. Ahrens and an Ahrens employee, Charlie Evans, provided access to the buildings. The first samples were obtained from the Ahrens office building. Ms. Kump Mitchell agreed that one sample from each end of the east-west trending hallway was best. No known sub-grade utilities were present. The flooring, observed to be in good condition, consisted of 12-inch tile over concrete.

Probe and Vapor Pin™ Installation

The first sample location, SSV-1, was collected at the western end of the hallway. A rotary hammer was used to create the requisite hole for placement of sample equipment, a Vapor Pin™. The hole diameter in the floor slab for the pin was approximately 1.5-inches. A 5/8-inch hole

was drilled through the slab and a least 1-inch below the slab to create a void. At this location, the floor slab was greater than 10-inches thick. After removal of the bit, the floor surface was cleaned, removing loose cuttings with a vacuum.

The Vapor Pin™ was installed in accordance with the manufacturer's instructions. Care was taken to ensure that a tight seal was made, and the protective cap on the Vapor Pin™ was in place to prevent vapor loss prior to sampling. The sub-slab sample point was flush mounted. Although the Teflon sleeve on the pin should create an adequate seal, a secondary check was performed, utilizing a water dam. Leak testing (shut-in for sampling train) was conducted to ensure a representative sample was collected from the sub-slab vapor probe location.

Collection of SSV-2 was at the eastern end of the hallway. The first three attempts to penetrate the concrete slab were each terminated after drilling nearly three feet into concrete. Upon concurrence with MDNR, the location was moved further east into a room beyond the hallway. The concrete was about 10-inches thick, as seen in the west end of the building, and a sample was collected at this location.

Sample SSV-3 was obtained from the bus maintenance building. The specific location was at the southwest corner of the break room. Sample SSV-4 was also obtained from the bus maintenance building, collected from the northeast end of the break room. The concrete slab for these two locations was about 6.75-inches thick.

Sample Collection

At each sample location, the Vapor Pin™ was checked to determine that the pin was not blocked with material that could interfere with air flow. A lab-certified, pre-evacuated, clean 1.0-L Summa® canister was attached to the pin via Teflon tubing. The valve on Summa® canister was then opened. The sub-slab vapor sample was drawn into the canister by pressure equilibration. The sampling time varied by location.

Once this sample, designated SSV-1, was collected, the Summa® valve was closed, and the Teflon tubing was removed. The vapor pin was then removed from the hole. Using Ace® brand, quick-curing, hydraulic cement mixed according to manufacturer's directions, the penetration was sealed. A metal rod was used to tamp the cement mixture so that cement was placed from the base of the hole to the surface. This approach was used on each of the samples/sample locations.

During sampling at sub-slab location SSV-3, it was observed that the flow control valve portion of the sampling apparatus was bent, preventing air flow into the canister. The sampling apparatus swas disassembled to remove t he bent section and reassembled without the flow control valve or pressure gauge. The lab confirmed sufficient sample was received.

Sample number, sample location, and date collected was recorded on the chain of custody form and on the blank tag attached to the canister. The sample was submitted for analysis using EPA

Method TO-15 for those COPCs previously described. This general approach was followed for each of the samples collected. The samples were taken to TekLab for analyses.

Analytical Testing

In accordance with the approved work plan, the samples were analyzed for the COPCs by EPA Method TO-15. The results are attached to this report. Detected COPCs in SSV-1 included 1,1,1-trichloroethane, acetone, chloroform, cis-1,2-dichloroethene, PCE, TCE, and trans-1,2-dichloroethene. Detected COPCs in SSV-2 included 1,1,1-trichloroethane, cis-1,2-dichloroethene, PCE, and TCE. Detected COPCs in SSV-3 included acetone, 1,1,1-trichloroethane, PCE, and toluene. Detected COPCs in SSV-4 included acetone, benzene, ethylbenzene, PCE, and toluene. Results are presented in Tables 1 through 4.

Quality Assurance – Data Validation

Sample Collection and Sample Receipt

Samples were and shipped to Teklab, Inc. on September 24, 2016, as noted in the chain-of-custody (COC) form provided to the laboratory with sample submittal. The applicable data package from Teklab is designated 16091675.

The chain-of-custody was maintained and the canisters were received by Teklab at their analytical facility in good condition. Samples were transferred to the North Bluff Road facility in Collinsville, IL, for analysis.

Upon arrival at the laboratory, pressure readings on the sample canisters were obtained and then compared to the readings taken in the field following sample collection. Each of the comparisons demonstrated less than 5 inches Hg loss from field to lab, with the exception of sample SSV-3. There was an equipment malfunction regarding the canister's in-line gauge as noted previously. Although it was not possible to obtain the final field pressure reading for SSV-3, the sample collection is considered to have been complete, similar to the other three samples collected, as confirmed by the laboratory sample receipt form. Because of this, and the fact that the other three sample canisters did not show a loss of pressure greater than 5 inches Hg from field to lab, all samples are deemed to have arrived at the laboratory in an acceptable manner.

Analytical Methods

Air samples were analyzed by method TO15, providing results for the following VOC analytes by Gas Chromatograph/Mass Spectrometry (GC/MS):

1. 1,1,1-trichloroethane
2. 1,2-dichloroethane
3. acetone
4. benzene
5. chlorobenzene

6. chloroform
7. cis-1,2-dichloroethene
8. ethylbenzene
9. methylene chloride
10. naphthalene
11. tetrachloroethene
12. toluene
13. trans-1,2-dichloroethene
14. trichloroethene
15. vinyl chloride
16. xylenes, total

Analytical Reporting Limits

Reporting limits for all data packages were within project requirements. However, due to high concentrations of some target analytes and/or matrix interference, analyses of some analytes required dilutions, as follows.

All VOCs analyzed in sample SSV-1 required a dilution to a factor of 200, except for tetrachloroethene and trichloroethene, which required dilutions to a factor of 1000.

All VOCs analyzed in sample SSV-2 required a dilution to a factor of 200, except for trichloroethene, which required a dilution to a factor of 1000.

All VOCs analyzed in samples SSV-3 and SSV-4 required a dilution to a factor of 2, except for acetone, which required a dilution to a factor of 20.

Laboratory Data Packages

The laboratory analytical data packages were complete, including the Quality Control information. A COC was included with each laboratory data package, double-signed and dated.

Sample Preservation

Sample preservation is not applicable for air samples.

Holding Times

All samples were analyzed by the laboratory within the specified holding. Samples were collected on September 24, 2016 and analyzed on September 28.

Blanks

Two method blank samples were analyzed for this batch of VOCs. Neither resulted in any detections above the method reporting limit.

Laboratory Control Sample

Two laboratory control samples (LCSs) with corresponding laboratory control sample duplicates (LCSDs) were analyzed for this batch. The percent recoveries of compounds spiked/analyzed were all within the percent quality control range limits and the relative percent difference (RPDs) for the duplicates were within the quality control criteria range.

Surrogate Recoveries

Surrogate recoveries for each of the four air samples were within the acceptable criteria range.

On the basis of the data validation described above, all sample data are deemed to be of sufficient quality.

Data Evaluation

As described in the work plan, for consistency in screening and evaluating data for an industrial risk scenario, if the sum of the carcinogenic risks exceeds 1E-05, or if the VI hazards sum exceeds 1.0, the next phase, an indoor air study, will be triggered.

USEPA's VISL Calculator (USEPA, May 2016) was used to calculate risk for chemicals analyzed in each gas sample. Detected chemical concentrations were input into the Sub-slab or Exterior Gas Concentration to Indoor Air Concentration (SGC-IAC) model of the VISL. As a conservative measure, the method detection limit (MDL) concentrations of chemicals which were not detected were also input into the VISL SGC-IAC. As indicated above, there are no values in the VISL calculator for cis or trans 1,2-dichloroethene.

Tables 1 through 4 show the COPC concentrations and their respective cancer risk results and noncancer hazard indices (HIs; with the HI being a sum of the individual chemical's hazard quotients [HQs]). Only samples SSV-1 and SSV-2 demonstrated a cumulative cancer risk greater than 1E-05 as well as an exceedance of the noncancer HI criteria of 1.0. The chemicals which demonstrated the major contribution to the cumulative risks in sample SSV-1 are: Chloroform, PCE, and TCE. Each of the risk results for those chemicals demonstrated either a cancer risk greater than 1E-05 and/or an HQ greater than 1.0. For sample SSV-2, the following constituents exceeded at least one of those criteria: PCE, and TCE.

Based upon the data for SSV-3 and SSV-4, criteria were not exceeded, either individually or cumulatively. Supporting documentation of the calculations and evaluation are attached to this report.

Conclusions and Recommendations

Based upon the work conducted and evaluation of the data, as no criteria were exceeded for samples obtained from the bus maintenance building, no additional work is needed per the VI Work Plan for that structure.

Mr. Bruce Morrison
February 9, 2017

Based upon evaluation of the data obtained from the Ahrens office building, as criteria were exceeded, additional work is needed per the VI Work Plan. The next phase of work will be collection of indoor air samples. This task will be conducted per the Work Plan, with field work coordinated with the building owner. This first event will be conducted between December 15, 2016, and February 15, 2017, with two samples obtained from the building, per the approved work plan.

As described in the Work Plan, prior to sampling, a detailed survey of the building will be performed. The pre-sampling inspection will identify conditions that may affect or interfere with the proposed testing. The inspection will include the type of structure, floor layout, physical conditions, and airflows. A product inventory will help identify potential sources of interference.

Owners/occupants will also be requested to assist in filling out a pre-sampling questionnaire. The questionnaire and inventory survey will enable the sampling investigator to document various information on building construction, the occupants, and potential sources of indoor air contamination. A photo-ionization detector (PID) may also be used as a screening tool to identify potential sources for interference.

If there are questions or concerns related to this report, please contact Larry Rosen, who can be reached by phone at (314) 480-4694, or via email at larryr@environmentalops.com.

Respectfully submitted,
ENVIRONMENTAL OPERATIONS, INC.

Lawrence C. Rosen

Lawrence C. Rosen, R.G.
Senior Project Manager

Copy: Mr. Michael House/Solutia
Ms. Christine Kump-Mitchell/MDNR
Mr. Rich Nussbaum/ MDNR

Attachments: Figure 1 – General Site Plan
Figure 2 – Sample Locations
Tables 1 through 4 – Summary Data with Risk Criteria
VISL Calculation Supporting Documentation
Analytical Laboratory Report 16091675
Field notes

FIGURES

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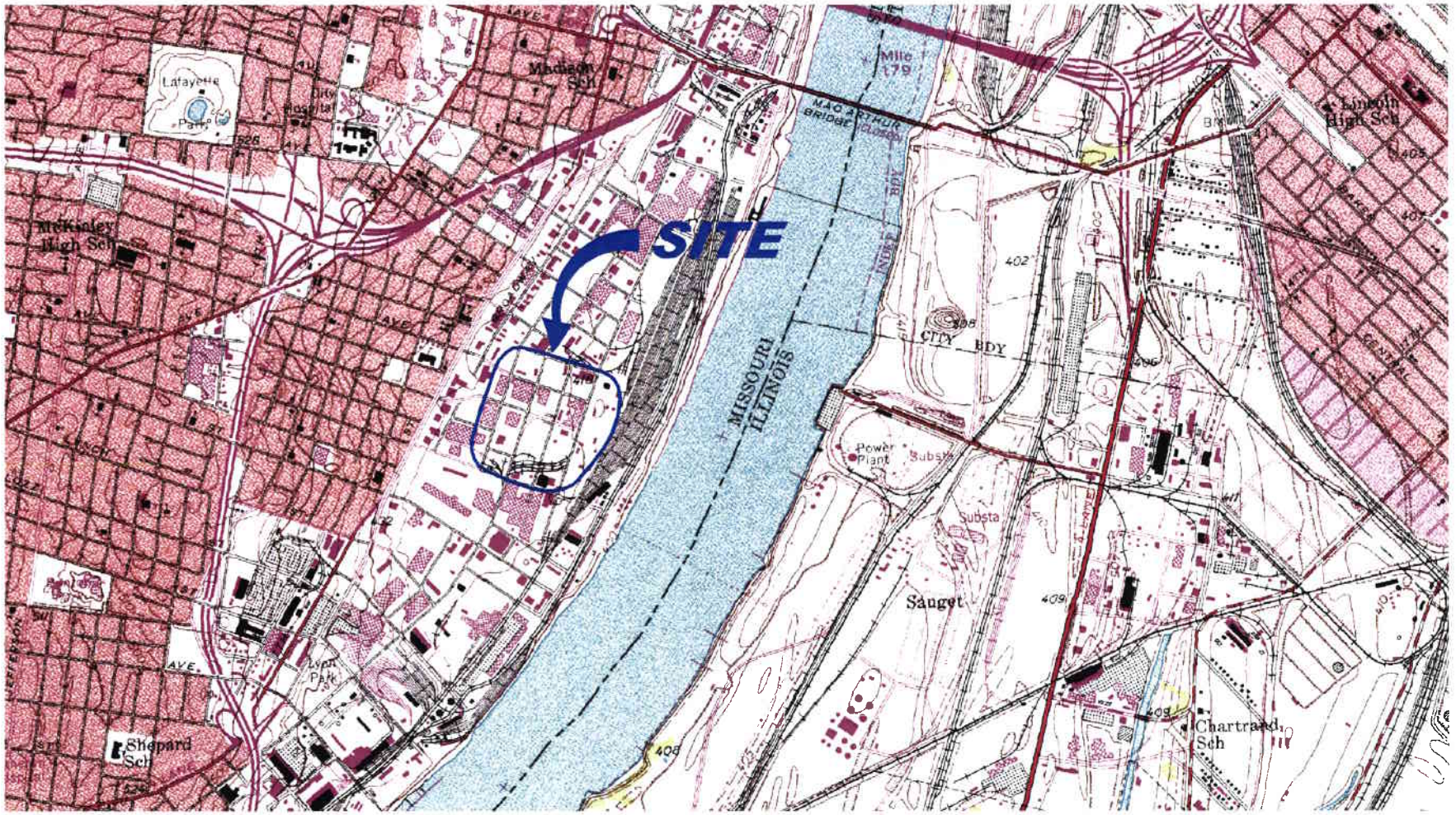

LEGEND

GENERAL LOCATION OF
J.F QUEENY PLANT

BASE MAP REFERENCE: MAP TAKEN FROM ELECTRONIC
USGS DIGITAL RASTER GRAPHIC 7.5 MINUTE SERIES
TOPOGRAPHIC MAP OF CAHOKIA, ILLINOIS, REVISED 1952

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SCALE FEET

Site Location Map

Former Solutia Queeny Plant
Saint Louis Missouri

Figure 1

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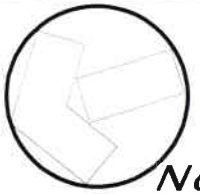
Project #2950R

Environmental Operations, Inc.



0 50 100 200

Approximate Scale, feet

Legend

- Sub-Slab Vapor Sample

Sub-Slab Vapor Sample Locations

Former Solutia Queeny Plant
Saint Louis, Missouri

Figure 2

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TABLES

Table 1 SSV-1

Date Collected 9/24/2016 9:26:00 AM

Sample SSV-1 (Nondetects at the Method Detection Level)

Analyte	Unit		Result	Unit		Result	Unit		Result	Qual	Commercial[1] VISL Results CR	Commercial[1] VISL Results HQ
Acetone	ppbv		630	mg/M3		1.4965	ug/m3		1496.5		No IUR	3.30E-04
Benzene	ppbv	<	10	mg/M3	<	0.0319	ug/m3	<	31.9		6.10E-07	7.30E-03
Chlorobenzene	ppbv	<	10	mg/M3	<	0.046	ug/m3	<	46		No IUR	6.30E-03
Chloroform	ppbv		216	mg/M3		1.0546	ug/m3		1054.6		5.90E-05	7.40E-02
1,2-Dichloroethane	ppbv	<	10	mg/M3	<	0.0405	ug/m3	<	40.5		2.60E-06	4.00E-02
Ethylbenzene	ppbv	<	10	mg/M3	<	0.0434	ug/m3	<	43.4		2.70E-07	3.00E-04
Methylene chloride	ppbv	<	10	mg/M3	<	0.0347	ug/m3	<	34.7		8.50E-10	4.00E-04
Naphthalene	ppbv	<	20	mg/M3	<	0.1048	ug/m3	<	104.8		8.70E-06	2.40E-01
Tetrachloroethene	ppbv		8240	mg/M3		55.8882	ug/m3		55888		3.60E-05	9.60E+00
Toluene	ppbv	<	50	mg/M3	<	0.0377	ug/m3	<	37.7		No IUR	5.20E-05
1,1,1-Trichloroethane	ppbv		276	mg/M3		1.5059	ug/m3		1505.9		No IUR	2.10E-03
Trichloroethene	ppbv		10600	mg/M3		56.9618	ug/m3		56962		5.70E-04	2.00E+02
Vinyl chloride	ppbv	<	10	mg/M3	<	0.0256	ug/m3	<	25.6		2.80E-07	1.80E-03
Xylenes, Total	ppbv	<	30	mg/M3	<	0.1303	ug/m3	<	130.3		No IUR	8.90E-03
cis-1,2-Dichloroethene	ppbv		172	mg/M3		0.682	ug/m3		682		No IUR	No RfC
trans-1,2-Dichloroethene	ppbv		108	mg/M3		0.4282	ug/m3		428.2		No IUR	No RfC

ppbv = parts per billion by volume

VISL = vapor intrusion screening level

[1]Results obtained using EPA's Vapor Intrusion Screening Level Calculator, May 2016 Regional Screening Levels (RSLs)

Carcinogenic Risk Sum = 6.8E-04

Noncancer Hazard Index = 2.1E+02

= risk results exceed criteria

Table 2 SSV-2

Date Collected 9/24/2016 9:43:00 AM

Sample SSV-2 (Nondetects at the Method Detection Level)

Analyte	Unit	Result	Unit	Result	Unit	Result	Qual	Commercial[1] VISL Results CR	Commercial[1] VISL Results HQ
Acetone	ppbv	< 40	mg/M3	< 0.095	ug/m3	< 95		No IUR	2.10E-05
Benzene	ppbv	< 10	mg/M3	< 0.0319	ug/m3	< 31.9		6.10E-07	7.30E-03
Chlorobenzene	ppbv	< 10	mg/M3	< 0.046	ug/m3	< 46		No IUR	6.30E-03
Chloroform	ppbv	< 20	mg/M3	< 0.0977	ug/m3	< 97.7		5.50E-06	6.80E-03
1,2-Dichloroethane	ppbv	< 10	mg/M3	< 0.0396	ug/m3	< 39.6		2.50E-06	3.90E-02
Ethylbenzene	ppbv	< 10	mg/M3	< 0.0434	ug/m3	< 43.4		2.70E-07	3.00E-04
Methylene chloride	ppbv	< 10	mg/M3	< 0.0347	ug/m3	< 34.7		8.50E-10	4.00E-04
Naphthalene	ppbv	< 20	mg/M3	< 0.1048	ug/m3	< 104.8		8.70E-06	2.40E-01
Tetrachloroethene	ppbv	7220	mg/M3	48.97	ug/m3	48970		3.10E-05	8.40E+00
Toluene	ppbv	< 10	mg/M3	< 0.0377	ug/m3	< 37.7		No IUR	5.20E-05
1,1,1-Trichloroethane	ppbv	410	mg/M3	2.237	ug/m3	2237		No IUR	3.10E-03
Trichloroethene	ppbv	518	mg/M3	2.7836	ug/m3	2783.6		2.80E-05	9.50E+00
Vinyl chloride	ppbv	< 10	mg/M3	< 0.0256	ug/m3	< 25.6		2.80E-07	1.80E-03
Xylenes, Total	ppbv	< 30	mg/M3	< 0.1303	ug/m3	< 130.3		No IUR	8.90E-03
cis-1,2-Dichloroethene	ppbv	226	mg/M3	0.8961	ug/m3	896.1		No IUR	No RfC
trans-1,2-Dichloroethene	ppbv	< 10	mg/M3	< 0.0396	ug/m3	< 39.6		No IUR	No RfC

ppbv = parts per billion by volume

VISL = vapor intrusion screening level

[1]Results obtained using EPA's Vapor Intrusion Screening Level Calculator, May 2016 Regional Screening Levels (RSLs)

Carcinogenic Risk Sum = 7.7E-05

Noncancer Hazard Index = 1.8E+01

= risk results exceed criteria

Table 3 SSV-3

Date Collected 9/24/2016 11:13:00 AM

Sample SSV-3 (Nondetects at the Method Detection Level)

Analyte	Unit	Result	Unit	Result	Unit	Result	Qual	Commercial[1] VISL Results CR	HQ
Acetone	ppbv	44.4	mg/M3	0.1055	ug/m3	105.5		No IUR	2.30E-05
Benzene	ppbv	< 0.1	mg/M3	< 0.0003	ug/m3	< 0.3		5.70E-09	6.80E-05
Chlorobenzene	ppbv	< 0.1	mg/M3	< 0.0005	ug/m3	< 0.5		No IUR	6.80E-05
Chloroform	ppbv	< 0.2	mg/M3	< 0.001	ug/m3	< 1		5.60E-08	7.00E-05
1,2-Dichloroethane	ppbv	< 0.1	mg/M3	< 0.0004	ug/m3	< 0.4		2.50E-08	3.90E-04
Ethylbenzene	ppbv	< 0.1	mg/M3	< 0.0004	ug/m3	< 0.4		2.40E-09	2.70E-06
Methylene chloride	ppbv	< 0.1	mg/M3	< 0.0003	ug/m3	< 0.3		7.30E-12	3.40E-06
Naphthalene	ppbv	< 0.2	mg/M3	< 0.001	ug/m3	< 1		8.30E-08	2.30E-03
Tetrachloroethene	ppbv	4.38	mg/M3	0.0297	ug/m3	29.7		1.90E-08	5.10E-03
Toluene	ppbv	1.08	mg/M3	0.0041	ug/m3	4.1		No IUR	5.60E-06
1,1,1-Trichloroethane	ppbv	1.12	mg/M3	0.0061	ug/m3	6.1		No IUR	8.40E-06
Trichloroethene	ppbv	< 0.1	mg/M3	< 0.0005	ug/m3	< 0.5		5.00E-09	1.73-03
Vinyl chloride	ppbv	< 0.1	mg/M3	< 0.0003	ug/m3	< 0.3		3.20E-09	2.10E-05
Xylenes, Total	ppbv	< 0.3	mg/M3	< 0.0013	ug/m3	< 1.3		No IUR	8.90E-05
cis-1,2-Dichloroethene	ppbv	< 0.1	mg/M3	< 0.0004	ug/m3	< 0.4		No IUR	No RfC
trans-1,2-Dichloroethene	ppbv	< 0.1	mg/M3	< 0.0004	ug/m3	< 0.4		No IUR	No RfC

ppbv = parts per billion by volume

VISL = vapor intrusion screening level

[1]Results obtained using EPA's Vapor Intrusion Screening Level Calculator, May 2016 Regional Screening Levels (RSLs)

Carcinogenic Risk Sum =	2.0E-07
Noncancer Hazard Index =	8.1E-03

Table 4 SSV-4

Date Collected 9/24/2016 11:07:00 AM

Sample SSV-4 (Nondetects at the Method Detection Level)

Analyte	Unit	Result	Unit	Result	Unit	Result	Qual	Commercial[1] VISL Results CR	Commercial[1] VISL Results HQ
Acetone	ppbv	53	mg/M3	0.1259	ug/m3	125.9		No IUR	2.80E-05
Benzene	ppbv	1.94	mg/M3	0.0062	ug/m3	6.2		1.20E-07	1.40E-03
Chlorobenzene	ppbv	< 0.1	mg/M3	< 0.0005	ug/m3	< 0.5		No IUR	6.80E-05
Chloroform	ppbv	< 0.2	mg/M3	< 0.001	ug/m3	< 1		5.60E-08	7.00E-05
1,2-Dichloroethane	ppbv	< 0.1	mg/M3	< 0.0004	ug/m3	< 0.4		2.50E-08	3.90E-04
Ethylbenzene	ppbv	1.44	mg/M3	0.0063	ug/m3	6.3		3.80E-08	4.30E-05
Methylene chloride	ppbv	< 0.1	mg/M3	< 0.0003	ug/m3	< 0.3		7.30E-12	3.40E-06
Naphthalene	ppbv	< 0.2	mg/M3	< 0.001	ug/m3	< 1		8.30E-08	2.30E-03
Tetrachloroethene	ppbv	4.86	mg/M3	0.033	ug/m3	33		2.10E-08	5.70E-03
Toluene	ppbv	4.56	mg/M3	0.0172	ug/m3	17.2		No IUR	2.40E-05
1,1,1-Trichloroethane	ppbv	< 0.1	mg/M3	< 0.0005	ug/m3	< 0.5		No IUR	6.80E-07
Trichloroethene	ppbv	< 0.1	mg/M3	< 0.0005	ug/m3	< 0.5		5.00E-09	1.70E-03
Vinyl chloride	ppbv	< 0.1	mg/M3	< 0.0003	ug/m3	< 0.3		3.20E-09	2.10E-05
Xylenes, Total	ppbv	< 0.3	mg/M3	< 0.0013	ug/m3	< 1.3		No IUR	8.90E-05
cis-1,2-Dichloroethene	ppbv	< 0.1	mg/M3	< 0.0004	ug/m3	< 0.4		No IUR	No RfC
trans-1,2-Dichloroethene	ppbv	< 0.1	mg/M3	< 0.0004	ug/m3	< 0.4		No IUR	No RfC

ppbv = parts per billion by volume

VISL = vapor intrusion screening level

[1]Results obtained using EPA's Vapor Intrusion Screening Level Calculator, May 2016 Regional Screening Levels (RSLs)

Carcinogenic Risk Sum =	3.5E-07
Noncancer Hazard Index =	1.2E-02

Mr. Bruce Morrison
February 9, 2017

VISL SUPPORTING DOCUMENTATION

EPA-OLEM VAPOR INTRUSION ASSESSMENT

Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.5.1 (May 2016 RSLs)

Queeny Site, St. Louis, MO SSV-1 Sub-Slab Sample

Parameter	Symbol	Value	Instructions
Exposure Scenario	Scenario	Commercial	Select residential or commercial scenario from pull down list
Target Risk for Carcinogens	TCR_SG	1.00E-05	Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F)
Target Hazard Quotient for Non-Carcinogens	THQ_SG	1	Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G)

CAS	Chemical Name	Site Sub-slab or Exterior Soil Gas Concentration Csg (ug/m³)	Calculated Indoor Air Concentration Cia (ug/m³)	VI Carcinogenic Risk CR	VI Hazard HQ	Inhalation Unit Risk IUR (ug/m³)⁻¹	IUR Source*	Reference Concentration RfC (mg/m³)	RFC Source*	Mutagenic Indicator I
67-64-1	Acetone	1.5E+03	4.49E+01	No IUR	3.3E-04			3.10E+01	A	
71-43-2	Benzene	3.2E+01	9.57E-01	6.1E-07	7.3E-03	7.80E-06	I	3.00E-02	I	
108-90-7	Chlorobenzene	4.6E+01	1.38E+00	No IUR	6.3E-03			5.00E-02	P	
67-66-3	Chloroform	1.1E+03	3.16E+01	**5.9E-05**	7.4E-02	2.30E-05	I	9.80E-02	A	
107-06-2	Dichloroethane, 1,2-	4.1E+01	1.22E+00	2.6E-06	4.0E-02	2.60E-05	I	7.00E-03	P	
100-41-4	Ethylbenzene	4.3E+01	1.30E+00	2.7E-07	3.0E-04	2.50E-06	CA	1.00E+00	I	
75-09-2	Methylene Chloride	3.5E+01	1.04E+00	8.5E-10	4.0E-04	1.00E-08	I	6.00E-01	I	Mut
91-20-3	Naphthalene	1.0E+02	3.14E+00	8.7E-06	2.4E-01	3.40E-05	CA	3.00E-03	I	
127-18-4	Tetrachloroethylene	5.6E+04	1.68E+03	**3.6E-05**	**9.6E+00**	2.60E-07	I	4.00E-02	I	
108-88-3	Toluene	3.8E+01	1.13E+00	No IUR	5.2E-05			5.00E+00	I	
71-55-6	Trichloroethane, 1,1,1-	1.5E+03	4.52E+01	No IUR	2.1E-03			5.00E+00	I	
79-01-6	Trichloroethylene	5.7E+04	1.71E+03	**5.7E-04**	**2.0E+02**	see note	I	2.00E-03	I	TCE
75-01-4	Vinyl Chloride	2.6E+01	7.68E-01	2.8E-07	1.8E-03	4.40E-06	I	1.00E-01	I	VC
1330-20-7	Xylenes	1.3E+02	3.91E+00	No IUR	8.9E-03			1.00E-01	I	

	Symbol	Value
Trichloroethylene		
Vinyl Chloride		

See the Navigation Guide equation for Cia,c for vinyl chloride.

Symbol	Value

EPA-OLEM VAPOR INTRUSION ASSESSMENT

Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.5.1 (May 2016 RSLs)

Queeny Site, St. Louis, MO SSV-2 Sub-Slab Sample

Parameter	Symbol	Value	Instructions
Exposure Scenario	Scenario	Commercial	Select residential or commercial scenario from pull down list
Target Risk for Carcinogens	TCR_SG	1.00E-05	Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F)
Target Hazard Quotient for Non-Carcinogens	THQ_SG	1	Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G)

CAS	Chemical Name	Site Sub-slab or Exterior Soil Gas Concentration Csg (ug/m^3)	Calculated Indoor Air Concentration Cia (ug/m^3)	VI Carcinogenic Risk CR	VI Hazard HQ	Inhalation Unit Risk IUR (ug/m^3)$^{-1}$	IUR Source*	Reference Concentration RfC (mg/m^3)	RFC Source*	Mutagenic Indicator I
67-64-1	Acetone	9.5E+01	2.85E+00	No IUR	2.1E-05			3.10E+01	A	
71-43-2	Benzene	3.2E+01	9.57E-01	6.1E-07	7.3E-03	7.80E-06	I	3.00E-02	I	
108-90-7	Chlorobenzene	4.6E+01	1.38E+00	No IUR	6.3E-03			5.00E-02	P	
67-66-3	Chloroform	9.8E+01	2.93E+00	5.5E-06	6.8E-03	2.30E-05	I	9.80E-02	A	
107-06-2	Dichloroethane, 1,2-	4.0E+01	1.19E+00	2.5E-06	3.9E-02	2.60E-05	I	7.00E-03	P	
100-41-4	Ethylbenzene	4.3E+01	1.30E+00	2.7E-07	3.0E-04	2.50E-06	CA	1.00E+00	I	
75-09-2	Methylene Chloride	3.5E+01	1.04E+00	8.5E-10	4.0E-04	1.00E-08	I	6.00E-01	I	Mut
91-20-3	Naphthalene	1.0E+02	3.14E+00	8.7E-06	2.4E-01	3.40E-05	CA	3.00E-03	I	
127-18-4	Tetrachloroethylene	4.9E+04	1.47E+03	**3.1E-05**	**8.4E+00**	2.60E-07	I	4.00E-02	I	
108-88-3	Toluene	3.8E+01	1.13E+00	No IUR	5.2E-05			5.00E+00	I	
71-55-6	Trichloroethane, 1,1,1-	2.2E+03	6.71E+01	No IUR	3.1E-03			5.00E+00	I	
79-01-6	Trichloroethylene	2.8E+03	8.35E+01	**2.8E-05**	**9.5E+00**	see note	I	2.00E-03	I	TCE
75-01-4	Vinyl Chloride	2.6E+01	7.68E-01	2.8E-07	1.8E-03	4.40E-06	I	1.00E-01	I	VC
1330-20-7	Xylenes	1.3E+02	3.91E+00	No IUR	8.9E-03			1.00E-01	I	
	Trichloroethylene				Symbol	Value	Symbol	Value		Symbol	Value
	Vinyl Chloride		See the Navigation Guide equation for Cia c for vinyl chlonde.								

EPA-OLEM VAPOR INTRUSION ASSESSMENT

Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.5.1 (May 2016 RSLs)

Queeny Site, St. Louis, MO SSV-3 Sub-Slab Sample

Parameter	Symbol	Value	Instructions
Exposure Scenario	Scenario	Commercial	Select residential or commercial scenario from pull down list
Target Risk for Carcinogens	TCR_SG	1.00E-05	Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F)
Target Hazard Quotient for Non-Carcinogens	THQ_SG	1	Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G)

CAS	Chemical Name	Site Sub-slab or Exterior Soil Gas Concentration Csg (ug/m^3)	Calculated Indoor Air Concentration Cia (ug/m^3)	VI Carcinogenic Risk CR	VI Hazard HQ	Inhalation Unit Risk IUR ($ug/m^3)^{-1}$	IUR Source*	Reference Concentration RfC (mg/m^3)	RFC Source*	Mutagenic Indicator I
67-64-1	Acetone	1.1E+02	3.17E+00	No IUR	2.3E-05			3.10E+01	A	
71-43-2	Benzene	3.0E-01	9.00E-03	5.7E-09	6.8E-05	7.80E-06	I	3.00E-02	I	
108-90-7	Chlorobenzene	5.0E-01	1.50E-02	No IUR	6.8E-05			5.00E-02	P	
67-66-3	Chloroform	1.0E+00	3.00E-02	5.6E-08	7.0E-05	2.30E-05	I	9.80E-02	A	
107-06-2	Dichloroethane, 1,2-	4.0E-01	1.20E-02	2.5E-08	3.9E-04	2.60E-05	I	7.00E-03	P	
100-41-4	Ethylbenzene	4.0E-01	1.20E-02	2.4E-09	2.7E-06	2.50E-06	CA	1.00E+00	I	
75-09-2	Methylene Chloride	3.0E-01	9.00E-03	7.3E-12	3.4E-06	1.00E-08	I	6.00E-01	I	Mut
91-20-3	Naphthalene	1.0E+00	3.00E-02	8.3E-08	2.3E-03	3.40E-05	CA	3.00E-03	I	
127-18-4	Tetrachloroethylene	3.0E+01	8.91E-01	1.9E-08	5.1E-03	2.60E-07	I	4.00E-02	I	
108-88-3	Toluene	4.1E+00	1.23E-01	No IUR	5.6E-06			5.00E+00	I	
71-55-6	Trichloroethane, 1,1,1-	6.1E+00	1.83E-01	No IUR	8.4E-06			5.00E+00	I	
79-01-6	Trichloroethylene	5.0E-01	1.50E-02	5.0E-09	1.7E-03	see note	I	2.00E-03	I	TCE
75-01-4	Vinyl Chloride	3.0E-01	9.00E-03	3.2E-09	2.1E-05	4.40E-06	I	1.00E-01	I	VC
1330-20-7	Xylenes	1.3E+00	3.90E-02	No IUR	8.9E-05			1.00E-01	I	
	Trichloroethylene				Symbol	Value	Symbol	Value		Symbol	Value
	Vinyl Chloride	See the Navigation Guide equation for Cia,c for vinyl chloride.									

EPA-OLEM VAPOR INTRUSION ASSESSMENT

Sub-slab or Exterior Soil Gas Concentration to Indoor Air Concentration (SGC-IAC) Calculator Version 3.5.1 (May 2016 RSLs)

Queeny Site, St. Louis, MO SSV-4 Sub-Slab Sample

Parameter	Symbol	Value	Instructions
Exposure Scenario	Scenario	Commercial	Select residential or commercial scenario from pull down list
Target Risk for Carcinogens	TCR_SG	1.00E-05	Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F)
Target Hazard Quotient for Non-Carcinogens	THQ_SG	1	Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G)

CAS	Chemical Name	Site Sub-slab or Exterior Soil Gas Concentration Csg (ug/m^3)	Calculated Indoor Air Concentration Cia (ug/m^3)	VI Carcinogenic Risk CR	VI Hazard HQ	Inhalation Unit Risk IUR ($ug/m^3)^{-1}$	IUR Source*	Reference Concentration RfC (mg/m^3)	RFC Source*	Mutagenic Indicator I
67-64-1	Acetone	1.3E+02	3.78E+00	No IUR	2.8E-05			3.10E+01	A	
71-43-2	Benzene	6.2E+00	1.86E-01	1.2E-07	1.4E-03	7.80E-06	I	3.00E-02	I	
108-90-7	Chlorobenzene	5.0E-01	1.50E-02	No IUR	6.8E-05			5.00E-02	P	
67-66-3	Chloroform	1.0E+00	3.00E-02	5.6E-08	7.0E-05	2.30E-05	I	9.80E-02	A	
107-06-2	Dichloroethane, 1,2-	4.0E-01	1.20E-02	2.5E-08	3.9E-04	2.60E-05	I	7.00E-03	P	
100-41-4	Ethylbenzene	6.3E+00	1.89E-01	3.9E-08	4.3E-05	2.50E-06	CA	1.00E+00	I	
75-09-2	Methylene Chloride	3.0E-01	9.00E-03	7.3E-12	3.4E-06	1.00E-08	I	6.00E-01	I	Mut
91-20-3	Naphthalene	1.0E+00	3.00E-02	8.3E-08	2.3E-03	3.40E-05	CA	3.00E-03	I	
127-18-4	Tetrachloroethylene	3.3E+01	9.90E-01	2.1E-08	5.7E-03	2.60E-07	I	4.00E-02	I	
108-88-3	Toluene	1.7E+01	5.16E-01	No IUR	2.4E-05			5.00E+00	I	
71-55-6	Trichloroethane, 1,1,1-	5.0E-01	1.50E-02	No IUR	6.8E-07			5.00E+00	I	
79-01-6	Trichloroethylene	5.0E-01	1.50E-02	5.0E-09	1.7E-03	see note	I	2.00E-03	I	TCE
75-01-4	Vinyl Chloride	3.0E-01	9.00E-03	3.2E-09	2.1E-05	4.40E-06	I	1.00E-01	I	VC
1330-20-7	Xylenes	1.3E+00	3.90E-02	No IUR	8.9E-05			1.00E-01	I	
	Trichloroethylene				Symbol	Value	Symbol	Value		Symbol	Value
	Vinyl Chloride	See the Navigation Guide equation for Cia,c for vinyl chloride.									